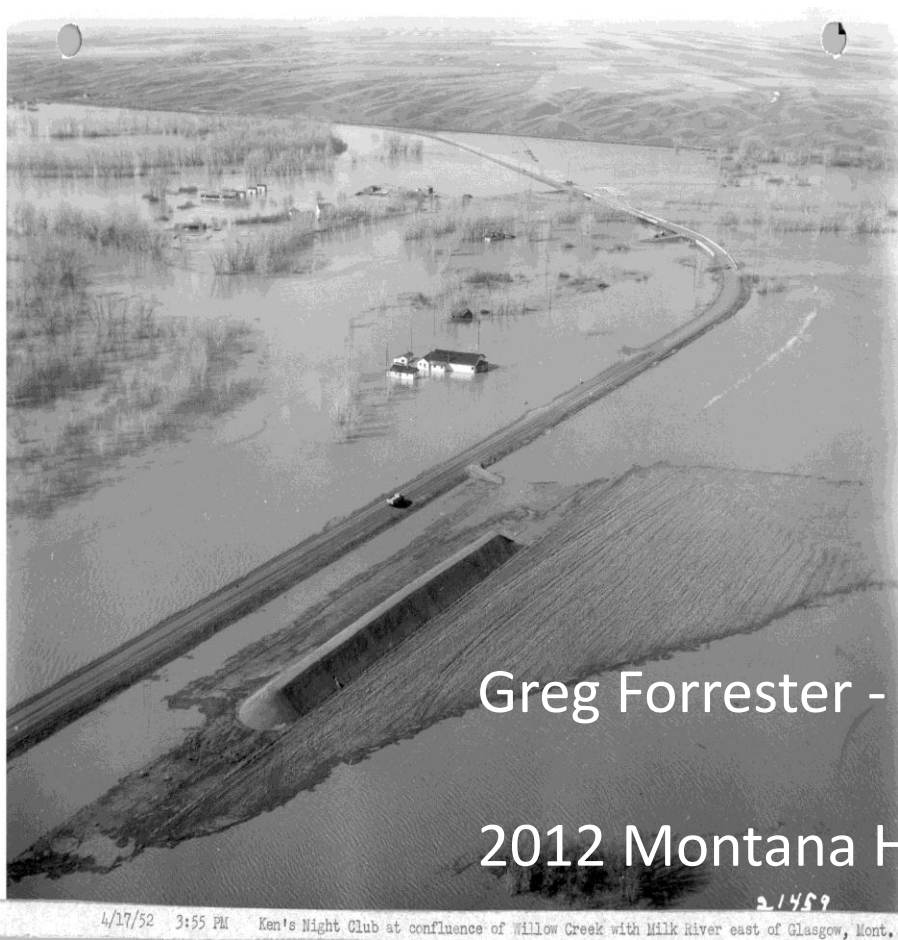


Comparison of the 1952 and 2011 Floods on the Lower Milk River



Greg Forrester - NWS Glasgow, MT

2012 Montana Hydrology Conference

Special Thanks

Dr. E. R. Dodge, Head, Department of Civil Engineering of Montana State College (now University) Bozeman for preparing the US Bureau of Reclamation Report on the 1952 Spring Milk River Flood.

Without that report, this comparison would not have been possible.

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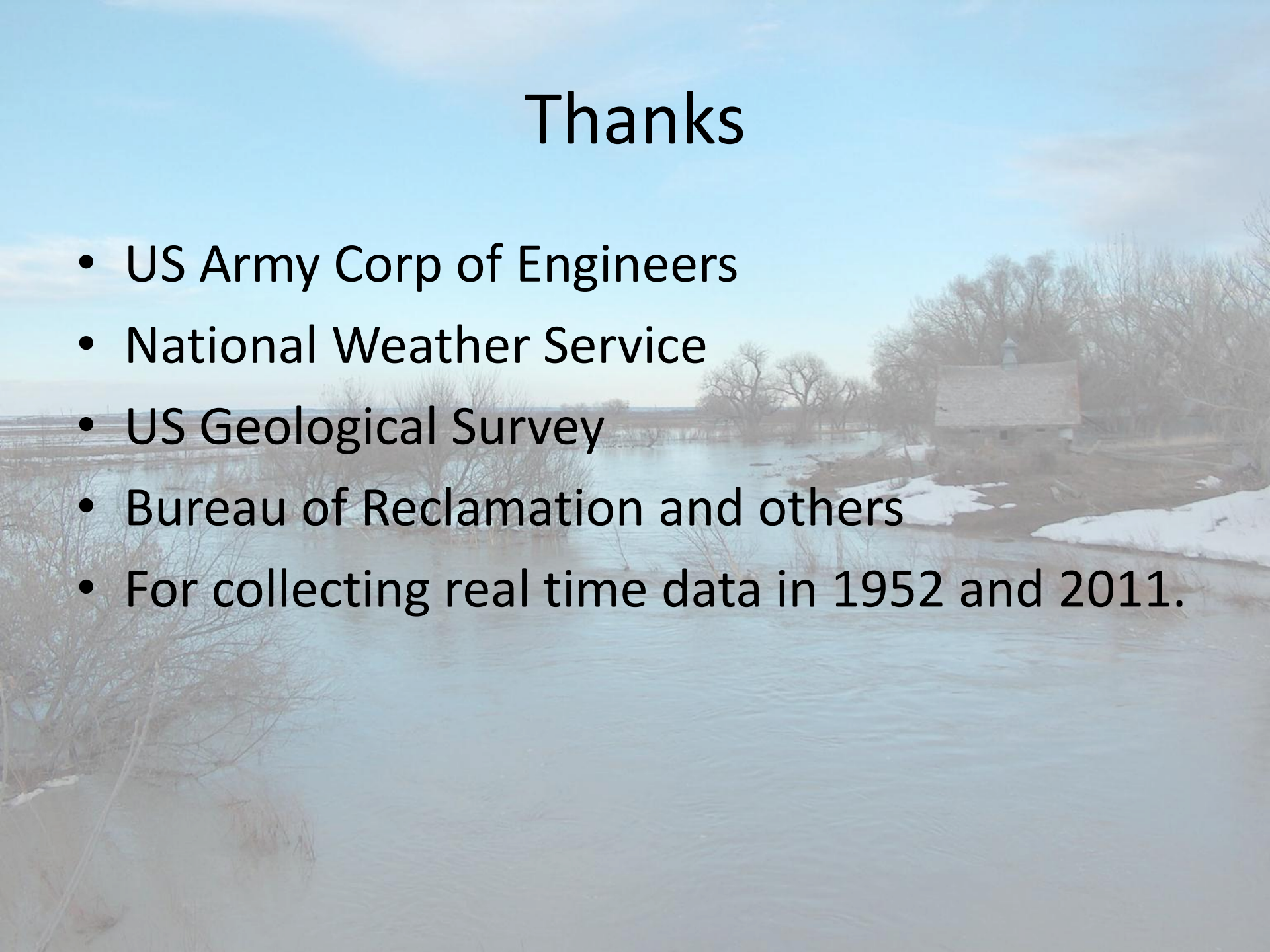
4/19/52

8:25 AM

Looking west along south levee at Glasgow, Montana. Deaconess Nurses' Home in right foreground. Levee built by Corps of Engineers in 1926.

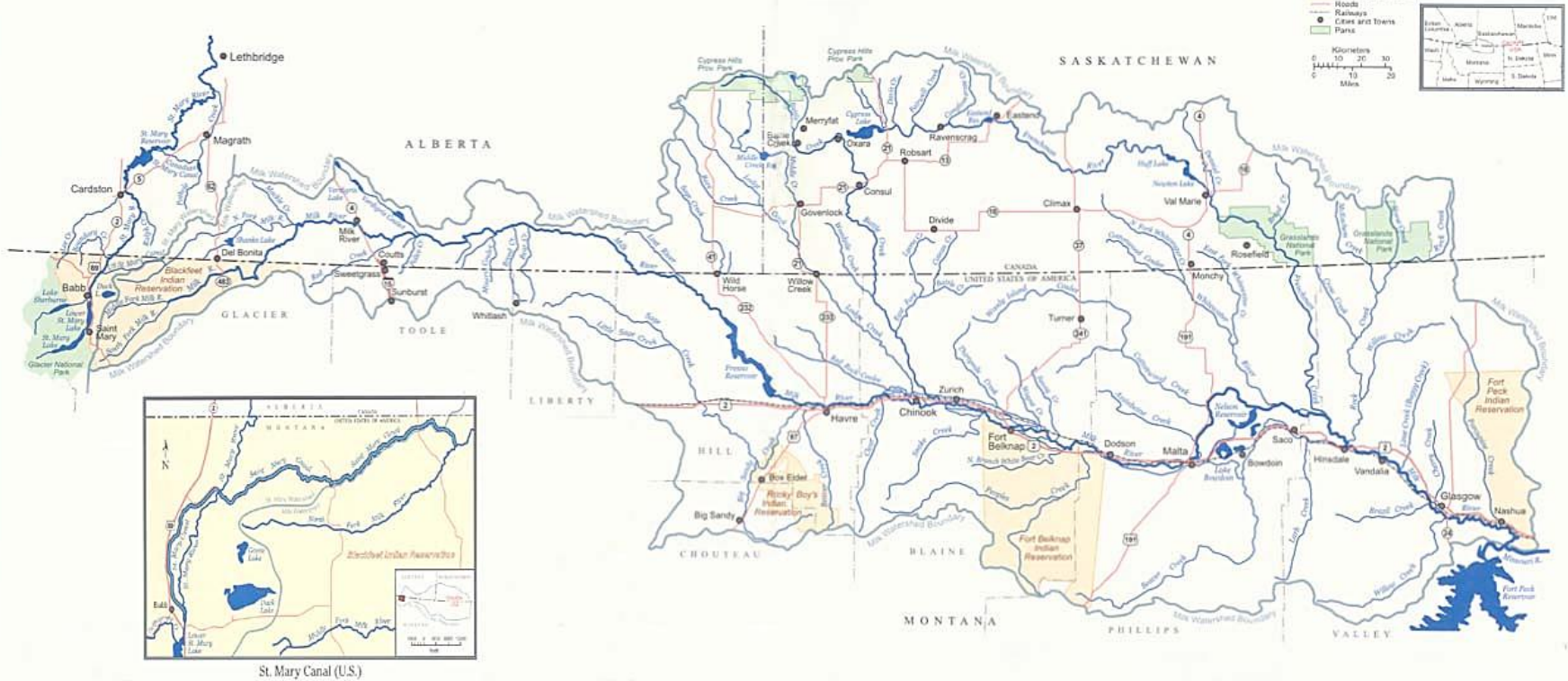
Thanks

- US Army Corp of Engineers
- National Weather Service
- US Geological Survey
- Bureau of Reclamation and others
- For collecting real time data in 1952 and 2011.



Milk River

The Milk River Watershed

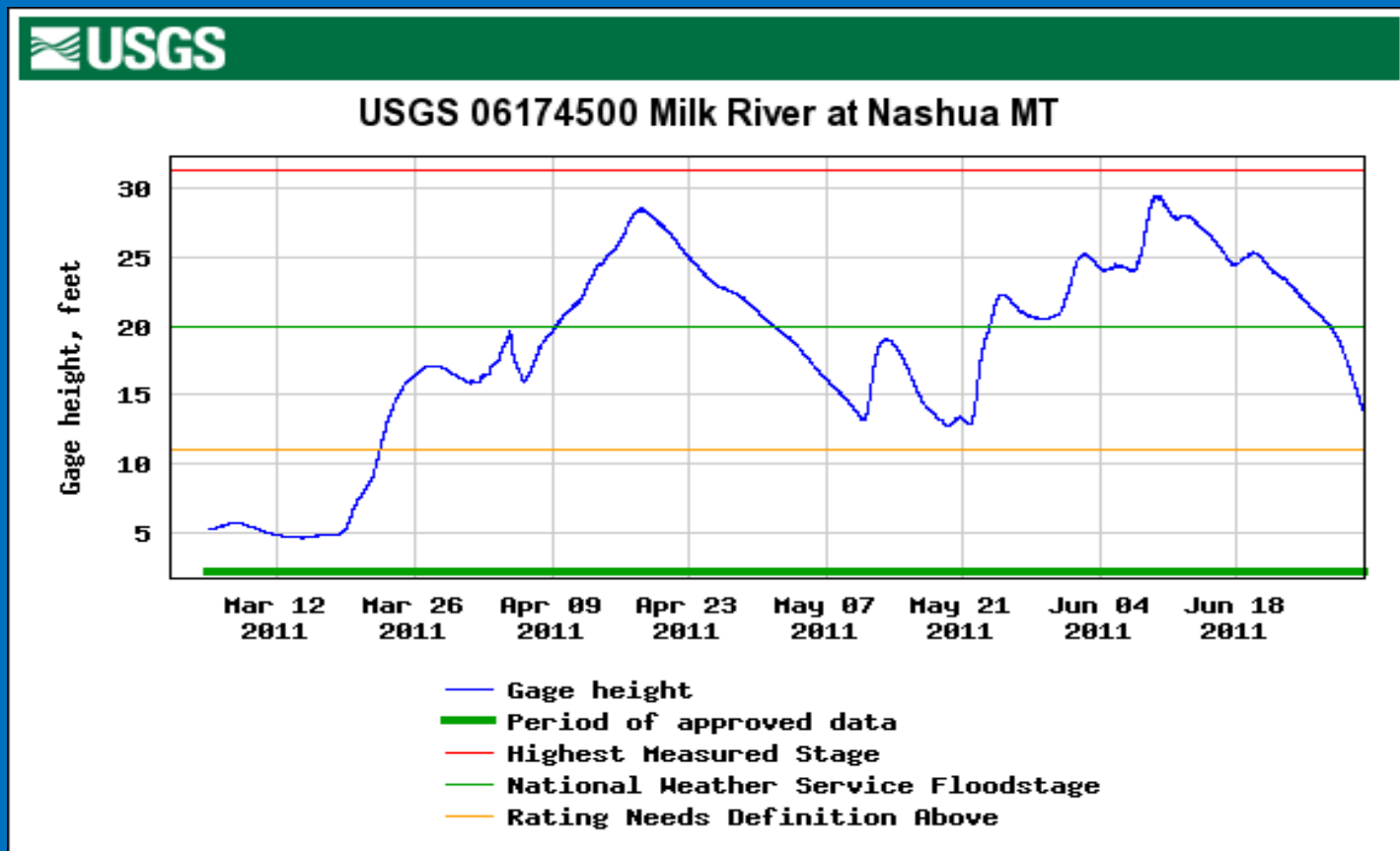


Similarities

- 1952 and 2011 were both years where major floods occurred some where on the Milk River.
- Both years had snowmelt flooding.
- Both years had wet weather in the late summer and early fall preceding that winter.
- Both years had winters with heavy snowfall and below normal temperatures.

Differences

- In 2011, heavy rain in May and June produced additional flooding.



Differences

- Winter 2010-11 wetter than 1951-52.
- October to March basin average precipitation
- 5.11 inches versus 4.17 inches.
- Normal 3.06 in 2011 vs 2.80 in 1952

Differences - continued

- 2010 was a wetter year than 1951
- Basin average 16.84 inches vs 14.51 inches

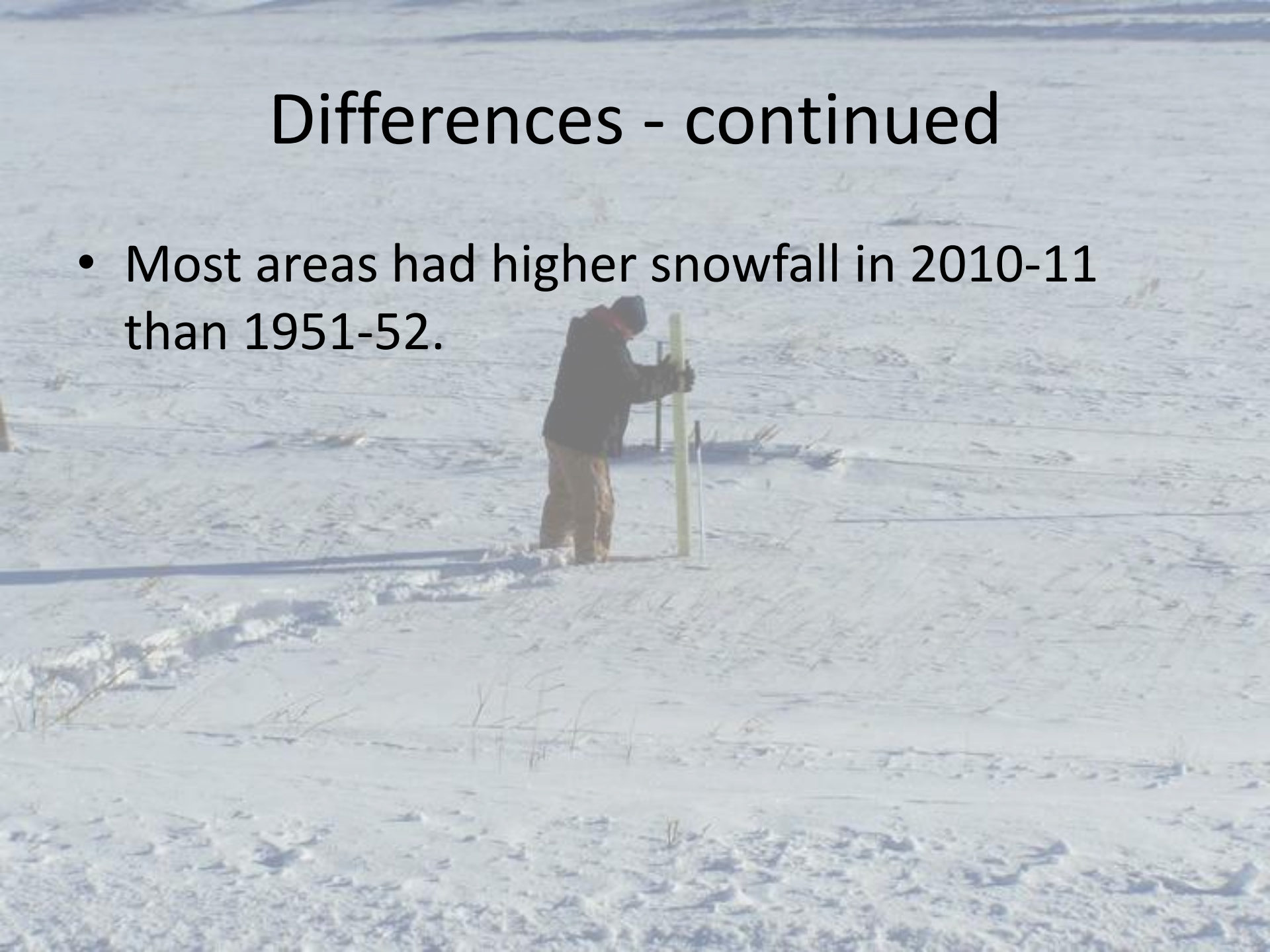


Differences - continued

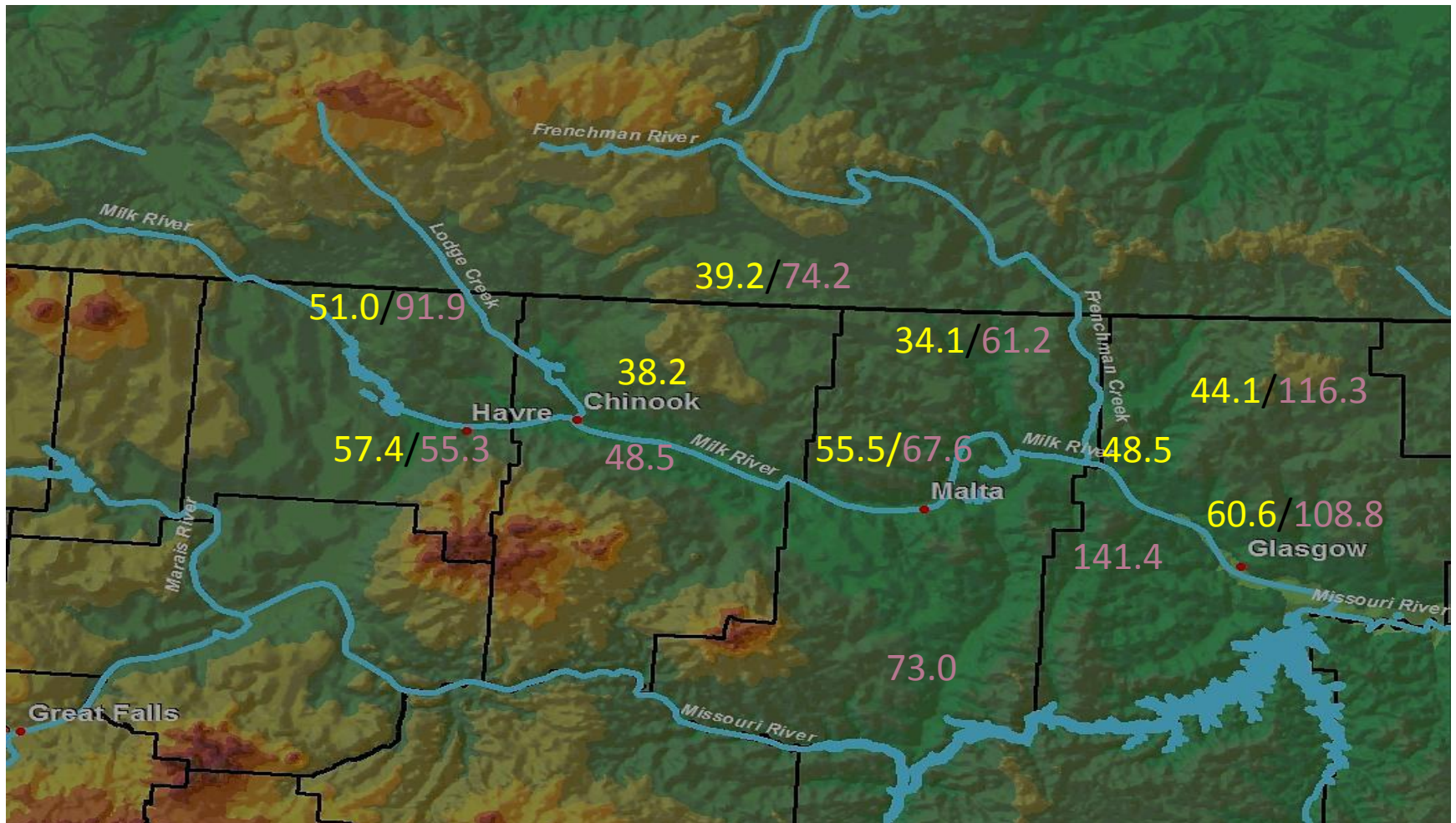
- Fall 2010 had a period of warm and dry weather from mid September through mid November.
- Fall 1951 had snow in Late October and early that melted in mid to late November and added to the ground moisture.
- Glasgow 14 inches, Malta 12 inches
- Havre 10 inches, Loring 7 inches

Differences - continued

- Most areas had higher snowfall in 2010-11 than 1951-52.



1951-52 vs 2010-11 Snowfall

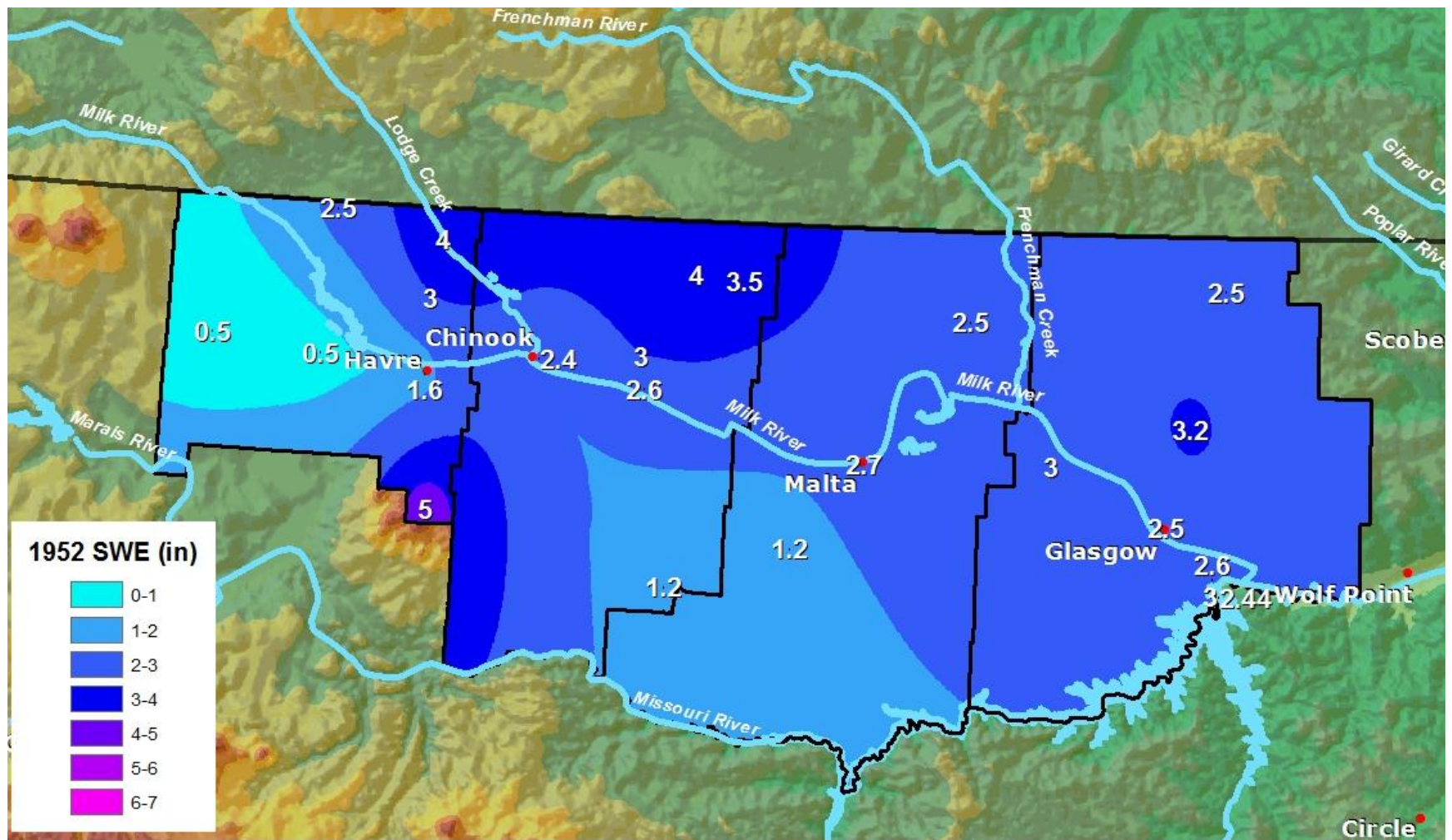


Snow Water Equivalent Field Measurements

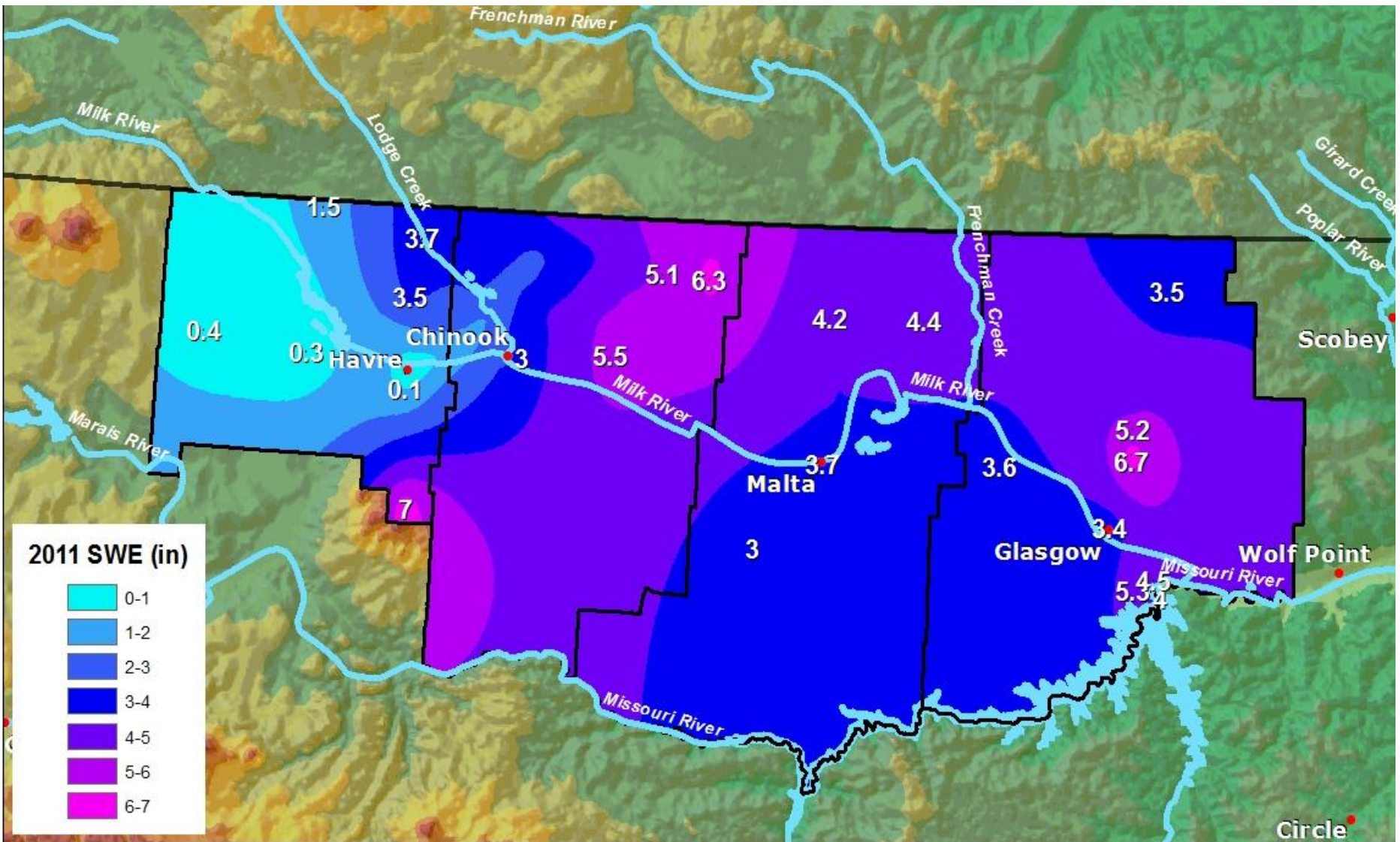
In inches

Location	3/1/1952	3/19/1952	3/1/2011	3/19/2011
Fort Peck	1.7	2.5	4.4	5.3
Frazer	2.1	2.6	4.5	3.7
Glasgow	2.0	2.5	3.4	3.4
St. Marie	n/a	3.2 (8N)	6.0	6.7
Malta	1.8	2.7	4.2	3.7
Opheim	2.5	n/a	3.7	n/a
Turner	2.2	3.5	10.9 (8SW)	6.3 (12.4 at 8SW)
Havre	0.9	1.6	3.4 (14N)	3.5 (14N)
Harlem	1.7	2.6	6.4 (10N)	5.5 (10N)
Rocky Boy snotel	n/a	n/a	7.5	7.0

1952 Snow Water Equivalent

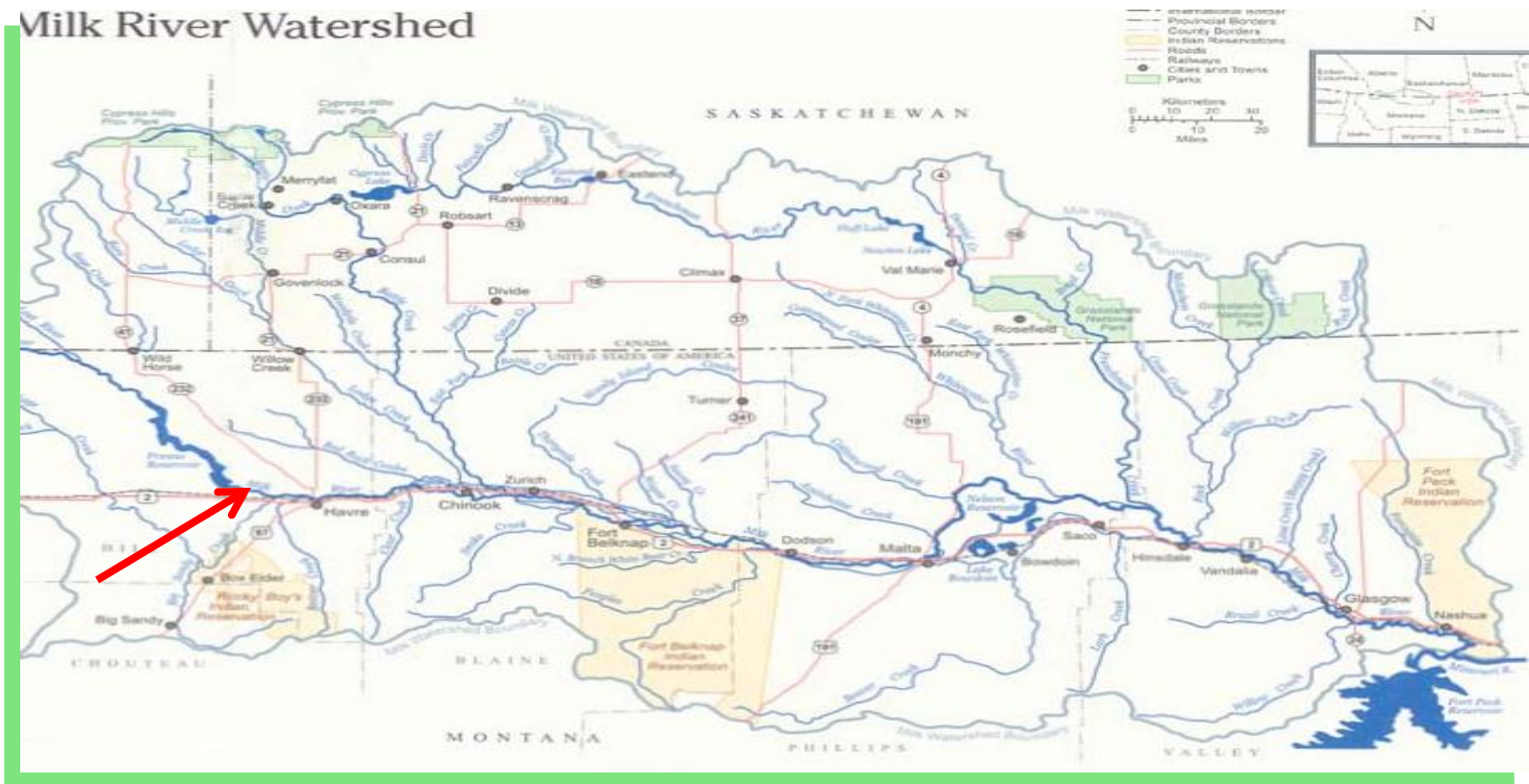


2011 Snow Water Equivalent



Floods

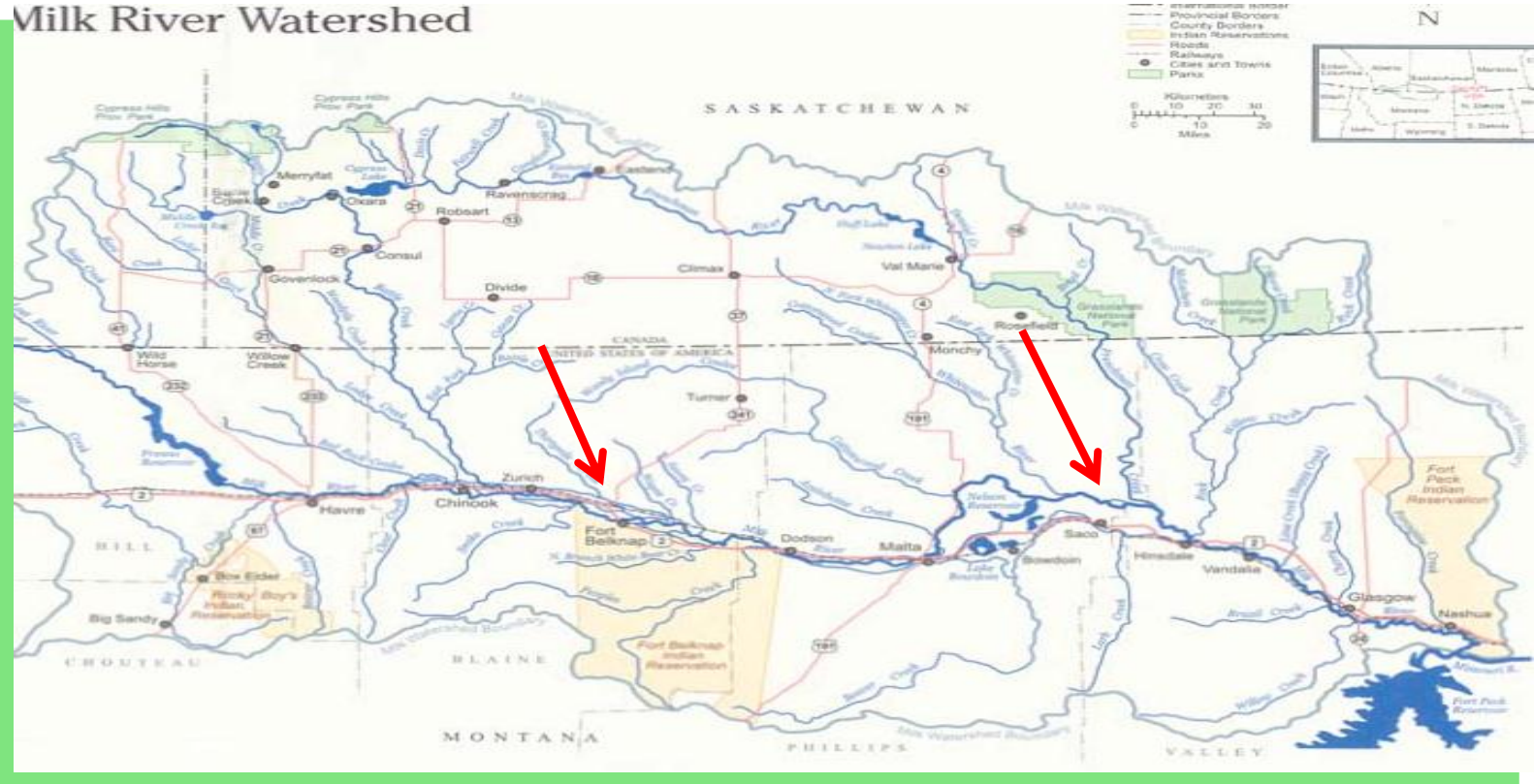
- 1952 Flood impacted the Milk River from Fresno Reservoir downstream.
- Set flow records that still stand at several locations.



Floods

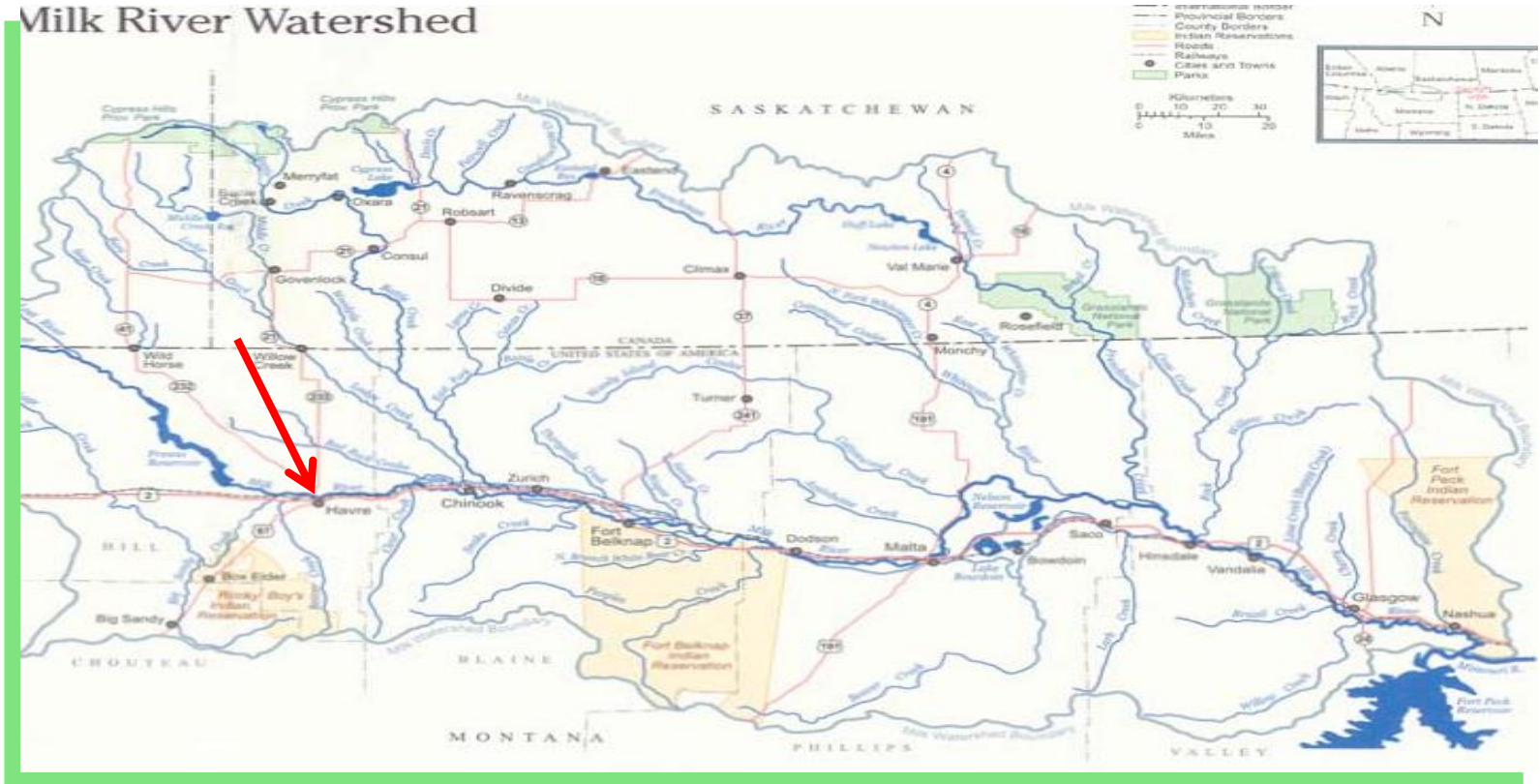
- March and April 2011 snowmelt flood impacted the Milk River over parts of Blaine County and from Saco downstream.

Milk River Watershed



Floods

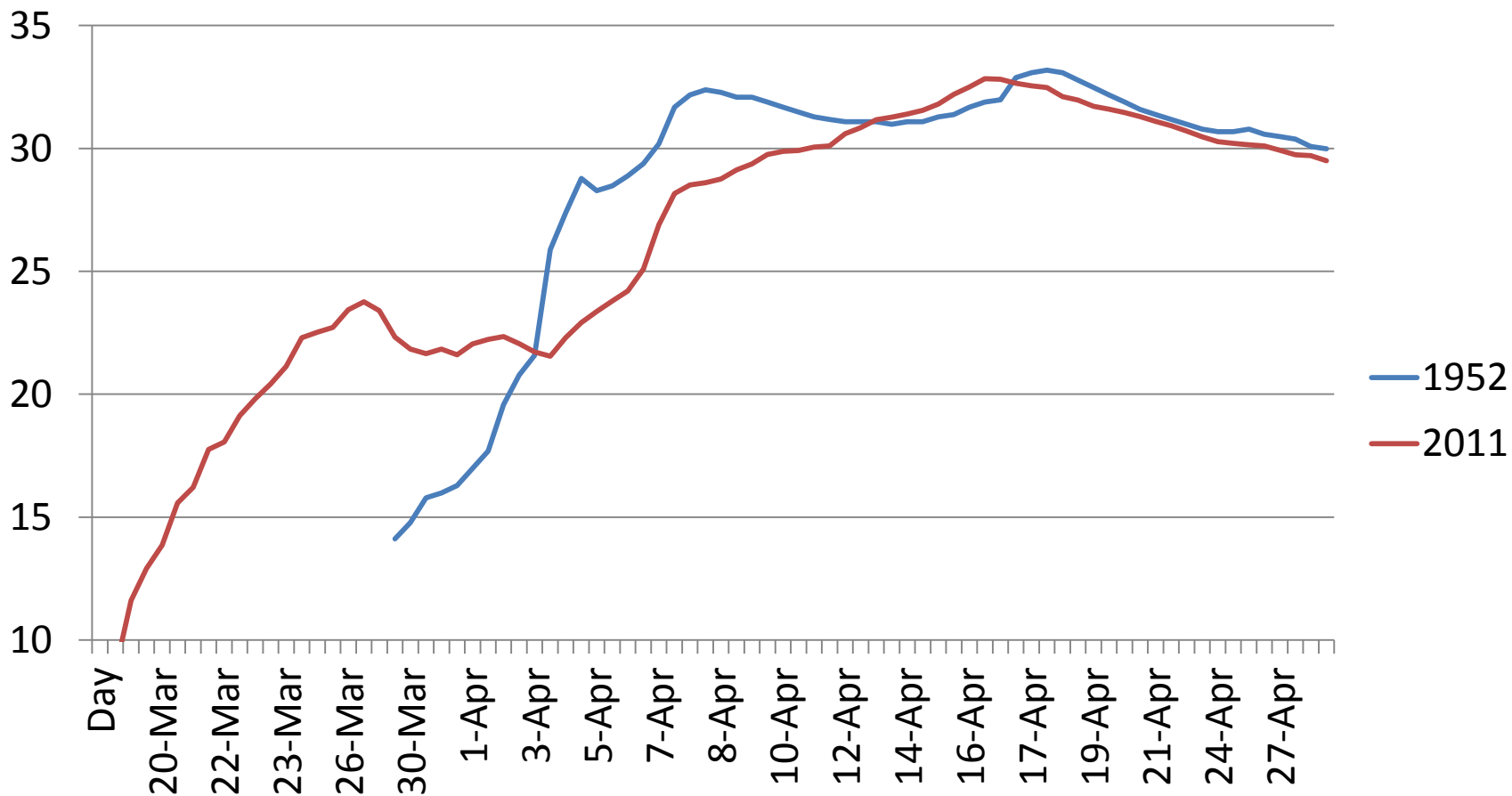
- May and June 2011 heavy rain flood impacted the Milk River from Havre downstream.



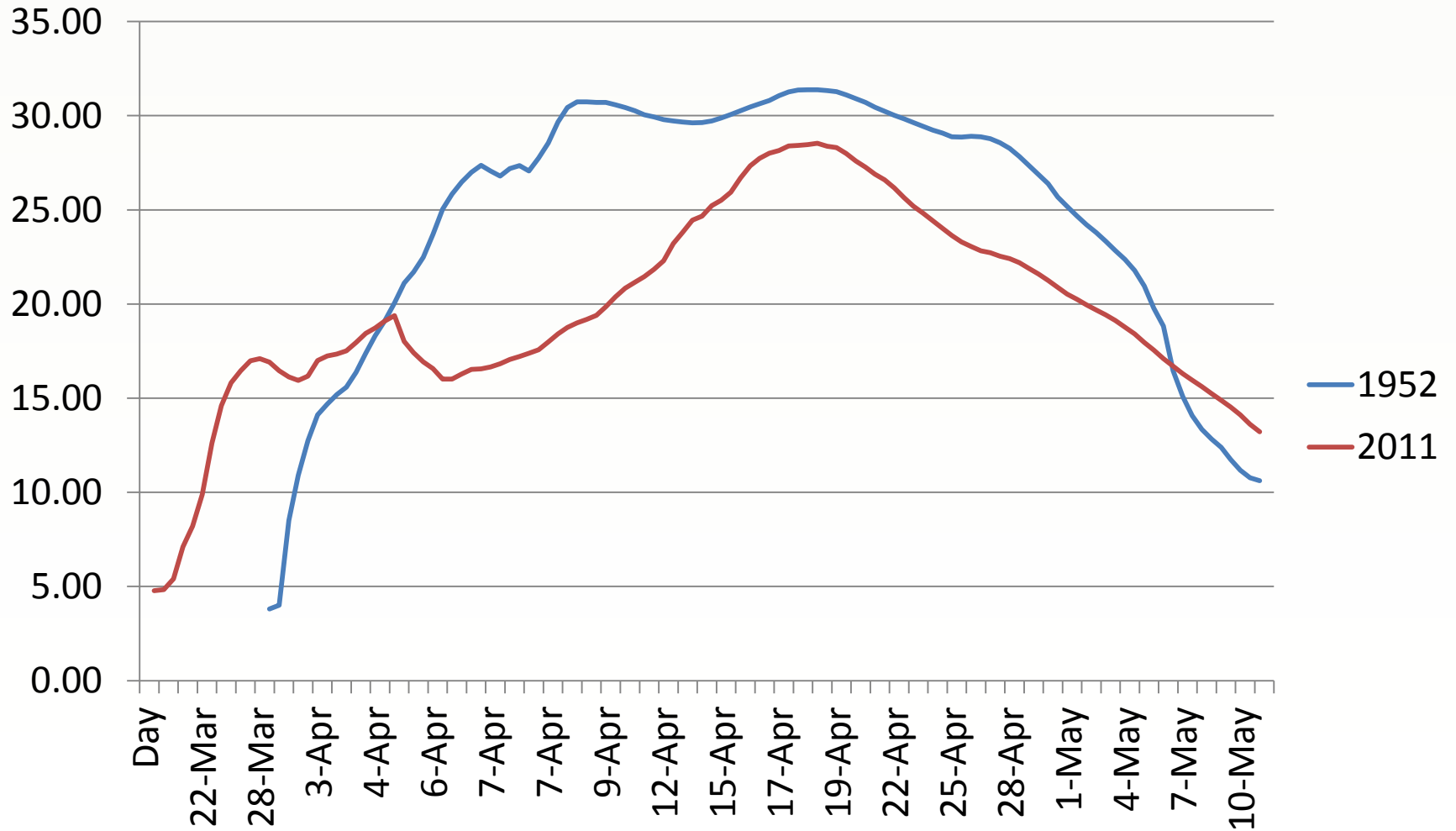
Flood Peak

Location (FS)	Snowmelt 1952	Snowmelt 2011	Spring Rain 2011
Havre	18.60 ft 11,400 cfs	5.48 ft 2020cfs	9.06 ft 4830 cfs
Harlem (21 ft)	19,000 cfs (est)	20.78 ft 4570 cfs	23.46 ft 6380 cfs
Dodson (23 ft)	n/a	22.93 ft icejam	26.25 ft 8550 cfs
Malta (16 ft)	22.26 ft 24,000 cfs	13.67 ft 6100 cfs (est)	17.64 ft 8900 cfs (est)
Saco (20 ft)	n/a	22.07 ft 10,300 cfs	21.53 ft 9820 cfs
Glasgow (25 ft)	33.20 ft 41,700 cfs	32.84 ft	34.08 ft
Nashua (20 ft)	31.38 ft 45,300 cfs	28.62 ft 20,500 cfs	29.52 ft 26,500 cfs
Beaver Creek Hinsdale (14 ft)	17.65 ft (est) 7580 cfs	17.96 ft 4930 cfs	19.44 ft 8210 cfs
Frenchman (12 ft) MT/SK border	19.90 ft 22,700 cfs	13.69 ft 3460 cfs	7.94 ft
Battle Creek (10 ft) Chinook	9500 cfs (est)	12.97 ft 3780 cfs	7.60 ft 1300 cfs

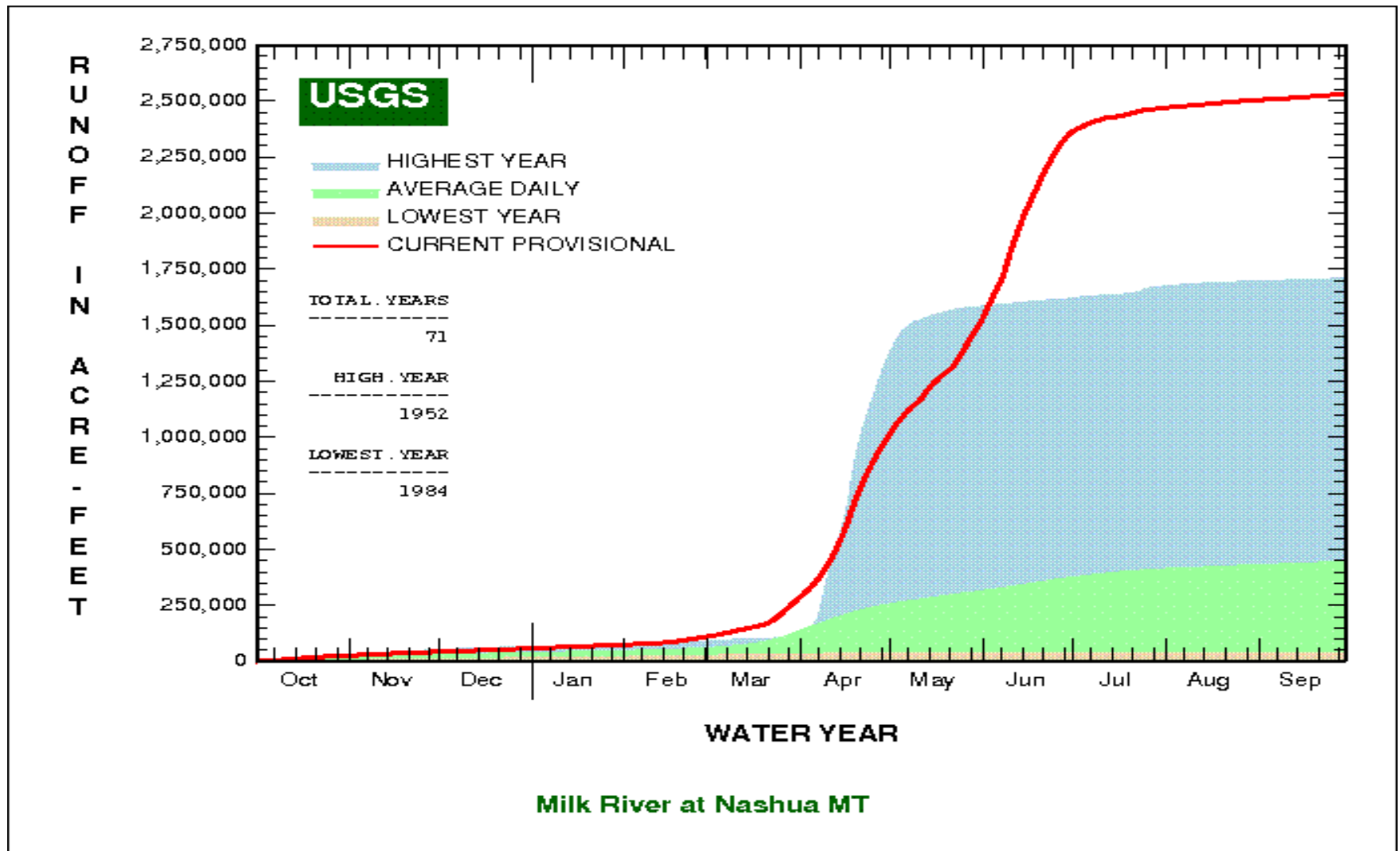
Glasgow Gage



Nashua Gage



2011 Runoff Plot



Snowmelt Flood

- 1952 Flood had higher peak flows and higher peak gage heights than 2011 Snowmelt Flood.
- This is despite 2011 having higher winter precipitation, snowfall and snow water equivalent than 1952.

1951-52 versus 2010-11

- Reasons 1952 Flood was worse than 2011
- Late summer rains and early season snowmelt moistened the ground in 1951.
- Widespread wetting rain occurred Dec 11-12, 1951 immediately followed by Arctic outbreak and snow.
- This resulted in wet frozen ground.
- Almost all snow melt became run off.

1951-52 versus 2010-11

- Late September to early November 2010 was warm and dry.
- This allowed the ground to dry out from the wet summer.
- Snow covered the ground as soon as temperatures fell in mid November.
- This allowed the ground to absorb some of the snow melt.

March 1952 versus 2011

- Both years had a cold, snowy March.
- 2011 somewhat warmer than 1952
- 25.4 versus 21.8
- 2011 had more above freezing days than 1952
- 1952 featured a sudden warm up at end of month that continued into April.

April 1952 versus 2011

- April 1952 much warmer than April 2011
- Areal Average: 48.5 versus 38.9
- Snowmelt in 1952 faster than in 2011.
- Area had 10 to 15 nights below freezing in April 1952.
- 2011 had 20 to 25 nights below freezing.

Malta Snow Depth



Frenchman Dam Failure

- Added to the flooding in 1952



4/15/52 5:45 P.M. Milk River Basin. Frenchman Creek Dam Spillway

21370

Conclusion

- Factors in 1952 Milk River Flood being worse than 2011 in magnitude.
- Wet frozen ground
- Rapid temperature rise and snowmelt
- Reservoir failures on the Frenchman
- 2011 wins the duration prize